

Claims

What is Claimed Is:

- 5     1. A fluorescent monodisperse nanoparticle comprising an organic core and a silica shell wherein the core-shell chemistry, composition, and architecture provides enhanced photophysical properties compared to free dye and core.
- 10    2. The fluorescent monodisperse nanoparticle of claim 1 wherein the enhanced photophysical properties comprise enhanced brightness, fluorescence quantum efficiency, photostability, or a combination thereof.
- 15    3. The fluorescent monodisperse nanoparticle of claim 1, wherein the core comprises a compact core surrounded by a silica shell.
- 20    4. The fluorescent monodisperse nanoparticle of claim 1, wherein the core comprises an expanded core surrounded by a silica shell.
- 25    5. The fluorescent monodisperse nanoparticle of claim 1 wherein the core comprises a homogenous particle with dyes sparsely embedded within surrounded by a silica shell.
- 30    6. The fluorescent monodisperse nanoparticle of claim 5 wherein the homogenous particle is not surrounded by a silica shell.
7. The fluorescent nanoparticle of claim 1, wherein the compact core has a radius of less than 2.5 nm.
8. The fluorescent nanoparticle of claim 1 wherein the extended core has a radius of greater than 2.5 nm.

9. A fluorescent nanoparticle of claim 1 wherein the core-shell chemistry, composition, and architecture provides the ability to control the photostability properties of the nanoparticle.
- 5 10. A method of making a fluorescent monodisperse nanoparticle with a compact core architecture comprising  
mixing a fluorescent compound and an organo-silane compound to form a dye precursor;  
mixing the resulting dye precursor with an aqueous solution to form a  
10 compact fluorescent core; and  
mixing the resulting compact core with a silica precursor to form a silica shell on the compact core, to provide the fluorescent monodisperse nanoparticle.
11. A method of making a fluorescent monodisperse nanoparticle with an expanded core architecture comprising  
mixing a fluorescent compound and an organo-silane compound to form a dye precursor;  
co-condensing the resulting dye precursor with a silica precursor to form an expanded fluorescent core; and  
20 mixing the resulting expanded core with a silica precursor to form a silica shell on the expanded core, to provide the fluorescent monodisperse nanoparticle.
12. A method of making a fluorescent monodisperse homogenous nanoparticle comprising  
mixing a fluorescent compound and an organo-silane compound to form a dye precursor; and  
co-condensing the resulting dye precursor with a silica to form a  
25 homogenous fluorescent monodisperse nanoparticle.

13. The method of claim 12 wherein the resulting homogenous nanoparticle is co-condensed with a silica to form a silica shell on the homogenous nanoparticle to provide the fluorescent monodisperse nanoparticle.